

graph of the Order of Oligochaeta," 1895, p. 122:—"Genital setæ associated with the male-pores only occur in the Megascolicidæ, the Eudrilidæ, and (rarely) in the Geoscolicidæ, Lumbriculidæ; in fact, they only occur in those families of terrestrial Oligochaeta in which the male-pores are provided with spermiducal glands"; he notes (p. 688) that the clitellar setæ of the Lumbricidæ are commonly modified in shape, being very much longer and thinner than those on the non-clitellar segments. Michaelsen, in the Tierreich volume on Oligochaeta, 1900, p. 470, gives as a family character of the Lumbricidæ that commonly the setæ on certain segments of the anterior part of the body are situated on papillæ, and modified as genital setæ in the form of "Furchenborsten," with longitudinal ridges and one or more intervening grooves at the distal end. In *Lumbricus terrestris* (p. 512), "Usually the ventral setæ of segm. 26 or (less often) 25 and 26 are situated on broad papillæ and modified as grooved genital setæ, slender, curved only at the proximal end, 1.6 mm. long and 45 μ thick."

The above statements are not in all respects concordant. The fullest of them, that of Borradaile,

can apparently be traced back, through Vejdosky's "System und Morphologie der Oligochaeten," 1884, p. 156, to Hering's paper in the *Zeitschrift für wissenschaftliche Zoologie*, vol. 8, 1857, p. 418, who states that peculiar setæ are found in *Lumbricus agri-cola* (another synonym of *L. terrestris*) in the ventral series in the tenth segment, in the fifteenth or one of the adjacent segments, in the region of segment 26, and, lastly, in the clitellar segments (31-38); these peculiar setæ are thinner and about double the usual length.

Some of the authors quoted above do not mention any modification of the setæ near the male apertures; of those who do mention it some do not say in what the modification consists, and those who describe it state that it is the same as the modification in certain other segments, e.g. those of the clitellum.

I have examined three specimens of *Lumbricus terrestris*, all with the clitellum and "ridges of puberty" (on segments 33-36) fully developed; as shown by the condition of the spermathecae, two had copulated, one apparently not. For comparison, an unmodified seta (a ventral seta of segment 17) was taken; this was of the well-known type, in length 0.74 mm., with the nodulus distal to the middle of the shaft (portion distal to nodulus is to portion proximal to nodulus as 2 is to 3).

In segments 8-10 the ventral setæ were much more massive than usual, and about 1.24 mm. long, but of the ordinary type (the larger size of the ventral setæ in the anterior segments can be appreciated on examining the surface of the worm with a lens). In segments 12-14 some setæ were massive, like those just described, while some were of about normal size (0.82 mm. long) or slightly larger (0.91 mm. long).

The ventral setæ of segment 15 were not discovered in one of the worms, perhaps because they had fallen out; in both worms which possessed them they were

0.87-0.91 mm. long, with nodulus about the middle, the shaft gradually tapering from nodulus to tip, and only slightly curved (Fig. 1, b); the tip was excavated, somewhat like a sugar-scoop (Fig. 1, c). The lateral setæ of this segment are of the usual size and type.

The ventral setæ of segments 25 and 26 were not at all modified in type, though they were rather larger than the one taken for comparison (0.96, 1.07, 1.17, and 1.2 mm. long).

The setæ of the clitellar segments correspond to the descriptions of the authors quoted. They were 1.85 mm. long, slender, with no distinct nodulus, though the shaft was thickest a little above the proximal end; there was a marked proximal curve, and the shaft was almost straight in the rest of its extent; it tapered very gradually and ended in a blunt point, and was grooved or ridged along its sides in the distal half (Fig. 1, a).

In the specimens examined, therefore, the only modified setæ (apart from variations in size) were those of segment 15 and of the clitellum. The modification of the clitellar setæ was that described by certain of the authors above quoted; but that of the ventral setæ of segment 15 was of an altogether different type, which apparently has not hitherto been recognised.

J. STEPHENSON.

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Speaking Films.

IN the article on speaking films which appeared in NATURE of October 27 Prof. Rankine says: "Combinations of picture films and ordinary gramophones have been frequently tried without success sufficient to ensure their survival in practice. The difficulty, of course, mainly arises from the impossibility of preserving synchronism between a gramophone record and film."

This mechanical difficulty could be overcome, at least in the early stages of the life of a film, but even then a more serious difficulty, which may best be described as psychological, would remain. It must be remembered that both by the film pictures, the film sounds, or the gramophone sounds deceptions are practised on the human senses. The eye is deceived into believing that it sees real people in movement when it is doing no more than witnessing the antics of graduated shadows. If the film fails to deceive the sense of seeing, it fails also in its psychological effect. The intimacy with which devotees of the "pictures" speak of the "film stars" who are "featured" shows that they do indeed believe that they see them, that it is actually Charlie Chaplin or Mary Pickford who is present before them. It is only when the senses surrender themselves completely to this deception that the emotions are fully affected.

In the same way the gramophone deceives the sense of hearing. Unless we can actually believe that we hear Caruso or Sir Harry Lauder the enjoyment and the effect will remain partial.

Now, my own experience is that you may deceive one sense at a time, but not two. You may deceive the eye with the film or the ear with the gramophone, but if you attempt to deceive both together failure results and both deceptions are destroyed. Some years ago I witnessed a film which showed a nigger dancing to a banjo. As long as he only danced I forgot that he was a black-and-white picture on a white sheet, but when a gramophone attempted to render the words of his song and the banjo accompaniment the illusion disappeared. There was no appearance whatever of a nigger singing. What I

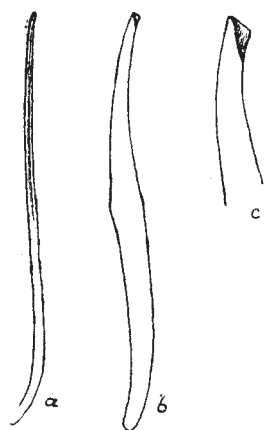


FIG. 1.—(a) Clitellar seta of *Lumbricus terrestris* (x30). (b) Ventral seta of segment 15 (x64). (c) Tip of ventral seta of segment 15 (x188).

saw was a shadow moving on a screen; what I heard was a gramophone making noises with all the familiar defects.

It is quite possible that in this case the synchronisation of film and record was not perfect, and that its inaccuracy helped to destroy the illusion, but it must be remembered that both one and the other—as Prof. Rankine indicates in the case of speech records—depend in great measure upon suggestion. The dominant part of a word gives us the key to the whole. Both words and pictures are scientifically “imperfect,” and when we attempt to amalgamate them the resultant imperfection is so great that the effect is wholly lost.

LOUGH PENDRED.

33 Norfolk Street, Strand, London, W.C.2,
October 28.

FROM practical experience I am able neither to confirm nor to contradict Mr. Pendred's interesting observations on the difficulty of practising simultaneous deceptions on the senses of seeing and hearing. It is quite possible, of course—perhaps likely—that it is easier to produce one such effect than both at once; but I can see no reason, *a priori*, for expecting the double deception to be impossible. It must be remembered that both moving pictures and ordinary gramophones have been improved greatly during the years since Mr. Pendred's experiences, and that, could perfect synchronisation be guaranteed, the results he describes might now be modified considerably. Mr. Pendred would, I think, admit that if both pictures and sounds could be sufficiently improved, the remaining imperfections, even though, possibly, additive, might yet be so small that the deceptions aimed at would both be effective.

There is no doubt that the photographic and photo-electric method of recording and reproducing sounds is much superior to the comparatively coarse methods used in ordinary gramophones; and this may quite well be a reason, in addition to the attainment of synchronisation, for the success of the talking pictures produced by Mr. Bergland, and spoken of so highly by the *Times* correspondent and by Prof. Arrhenius.

A. O. RANKINE.

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The Differentiation of Boiled and Unboiled Water.

It is often desirable to be able to ascertain whether water alleged to have been boiled for drinking purposes has in reality undergone the treatment. This may be readily determined by means of indicators appropriate to the type of water, for the effect of boiling is always to lower the hydrogen-ion concentration by removing carbon dioxide from solution and decomposing bicarbonates.

For example, Plymouth tap-water, a soft water from Dartmoor, is now at $pH6.8$, and gives a yellowish colour with phenol-red. On boiling in a hard glass test-tube it develops the full red with this reagent, a light pink with phenolphthalein, and a yellowish colour with thymol-blue. It is then at $pH8.5$.

Youghal tap-supply is at $pH7.0$ but contains far more bicarbonate than Dartmoor water, since on boiling it not only gives the full red with phenol-red, but also gives a more intense colour with phenolphthalein and a slaty-blue with thymol-blue, denoting $pH9.0$, the limit for water saturated with calcium carbonate in absence of carbonic acid.

Water from Blagdon Reservoir (Bristol supply) was found to be at $pH7.8$, and at Pusa, in Bihar, the laboratory tap-water is at $pH8.1$, that of the River

Gandak from which it is derived being somewhat more alkaline. Running streams may be up to $pH8.3$ even when derived from wells at $pH6.4$. Saunders (Proc. Cambr. Phil. Soc., 1921, vol. 20, p. 350) has shown that supplies in chalk and gault districts are at $pH7.1-7.2$ very constantly, streams rising to $pH8.25-8.5$. Sea-water is close to $pH8.2$.

For these more alkaline waters phenol-red would be an unsuitable reagent to detect the unboiled state, as even in it the full red is developed, but phenolphthalein would serve, showing either a colour or an increase in intensity with the boiled water.

Higher limiting values may be obtained with waters containing magnesium salts, since that for magnesium carbonate, on boiling, is close to $pH10.0$. Sea-water, therefore, may approximate to this, and fresh-water from a small reservoir on Staddon Heights, Plymouth Sound, was by insolation with its naturally occurring algæ brought up to $pH9.7$.

On cooling, carbon dioxide is re-absorbed by boiled water. This proceeds until the equilibrium with the bicarbonate stage is reached, which is at $pH8.37$ for saturated calcium bicarbonate. It is slightly lower for water which has been boiled, since it can no longer be saturated with respect to bicarbonate. This stage still gives a good colour with phenol-red, being more than $pH8$. With water which is naturally at this reaction when unboiled it is advisable to make a direct test to ascertain the time that elapses before the original reaction is regained, but a positive result may always be accepted as proof of boiling.

Since one omission to boil the water may, especially in the tropics, lead to a fatal illness, it is hoped that the use of phenolphthalein, phenol-red, or other suitable indicator may be of use.

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October 31.

Ophion luteus.

THIS fly, one of the larger Ichneumonidæ, appears in my house every year in late summer. Several members of my family have complained of being stung by it, always at night, usually after they had gone to bed in the top story, third above the basement. All doubt about the aggressor was dispelled by a young lady who, when reading in bed, felt a stab on the arm and saw the insect *flagrante delicto*. I am informed on high authority that, while Ophion is one of the few Ichneumonidæ which are known to sting, and while a small, narrow poison sac has been detected in a few species of that immense family, none has been recorded in *Ophion luteus*. But whereas the sting is followed in every instance by considerable inflammation and pain, such as would not be the effect of the mere stab of a needle, it seems almost certain that some irritant is injected into the wound, possibly for the purpose of paralysing the fly's legitimate victim, as in the case of the hunting-wasps.

It puzzles one to divine the purpose of Ophion in attacking sleeping human beings. The weapon employed is the sharp point of the ovipositor. It seems scarcely possible that the intention is that the progeny should be lodged and fed in the body of man, woman, or child. What is normally the creature which Ophion seeks as a harbour for its eggs and larvæ? Is this known? Only once have I seen Ophion in my own bedroom on the first floor. I was reading in bed one night in August last when the fly alighted on the sheet. I regret that instinct prevailed over reason, and I destroyed the creature before the purpose of its visit was revealed.

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